CLAIMS

1. A method for tracking objects in a sequence of video images, comprising the steps of:

storing object models relating to objects detected in previous video images of the sequence, the object models comprising values of characteristic features of the detected objects and variances of those values;

receiving a further video image of the sequence to be processed;

detecting objects in the received video image;

determining characteristic features of the detected objects;

calculating a distance measure between each detected object and each object model on the basis of the respective characteristic features using a distance function which takes into account at least the variance of the characteristic features;

matching the detected objects to the object models on the basis of the calculated distance measures; and

updating the object models using the characteristic features of the respective detected objects matched thereto.

2. A method according to claim 1, wherein the distance measure is a scaled Euclidean distance.

3. A method according to claim 2, wherein the distance function is of the form:-

$$D(l,k) = \sqrt{\sum_{i=1}^{N} \frac{(x_{li} - y_{ki})^2}{\sigma_{li}^2}}$$

for object model l and detected object k, where x_{li} and y_{ki} are values of the characteristic features of a stored object model and a detected object respectively, σ_{li}^2 is the corresponding component of the variance of each feature, and the index i runs through N features of an object model.

4. A method according to claim 1, wherein the distance measure is the Mahalanobis distance.

5. A method according to any of the preceding claims, and further comprising the step of predicting the values of the characteristic features of the stored object models for

the received frame; wherein the calculating step uses the predicted values of the characteristic features as the feature values from the object models.

6. A method according to any of the preceding claims, wherein if an object model is not matched to a detected object then the variances of the characteristic feature values of that object are increased.

7. A method according to any of the preceding claims, wherein if an object model is not matched to a detected object in the received image then the updating step comprises updating the characteristic feature values with an average of each respective value found for the same object over a predetermined number of previous images.

8. A method according to any of the preceding claims, wherein if an object model is not matched to a detected object in the received image then a test is performed to determine whether the object is overlapped with another object, and the object is considered as occluded if an overlap is detected.

9. A method according to any of the preceding claims, further comprising counting the number of consecutive video images for which each object is tracked, and outputting a tracking signal indicating that tracking has occurred if an object is tracked for a predetermined number of consecutive frames.

10. A method according to any of the preceding claims, wherein if an object model is not matched to a detected object in the received image then a count of the number of consecutive frames for which the object model is not matched is incremented, the method further comprising deleting the object model if the count exceeds a predetermined number.

11. A method according to any of the preceding claims, wherein if a detected object is not matched to an object model then a new object model is stored corresponding to the detected object.

12. A computer program or suite of computer programs arranged such that when executed on a computer it/they cause the computer to operate in accordance with any of the preceding claims.

13. A computer readable storage medium storing a computer program or at least one of a suite of computer programs according to claim 12.

14. A system for tracking objects in a sequence of video images, comprising:-

storage means for storing object models relating to objects detected in previous video images of the sequence, the object models comprising values of characteristic features of the detected objects and variances of those values;

means for receiving a further video image of the sequence to be processed; and

processing means arranged in use to:-

detect one or more objects in the received video image;

determine characteristic features of the detected objects;

calculate a distance measure between each detected object and each object model on the basis of the respective characteristic features using a distance function which takes into account at least the variance of the characteristic features;

match the detected objects to the object models on the basis of the calculated distance measures; and

update the stored object models using the characteristic features of the respective detected objects matched thereto.

15. A system according to claim 14, wherein the distance measure is a scaled Euclidean distance.

16. A system according to claim 15, wherein the distance function is of the form:-

$$D(l,k) = \sqrt{\sum_{i=1}^{N} \frac{(x_{li} - y_{ki})^2}{\sigma_{li}^2}}$$

for object model l and detected object k, where x_{li} and y_{ki} are values of the characteristic features of a stored object model and a detected object respectively, σ_{li}^2 is the corresponding component of the variance of each feature, and the index i runs through N features of an object model.

17. A system according to claim 14, wherein the distance measure is the Mahalanobis distance.

18. A system according to any of claims 14 to 17, and further comprising means for predicting the values of the characteristic features of the stored object models for the received frame; wherein the processing means uses the predicted values of the characteristic features as the feature values from the object models within the distance measure calculation.

19. A system according to any of claims 14 to 18, wherein if an object model is not matched to a detected object then the variances of the characteristic feature values of that object are increased.

20. A system according to any of claims 14 to 19, wherein if an object model is not matched to a detected object in the received image then the updating step comprises updating the characteristic feature values with an average of each respective value found for the same object over a predetermined number of previous images.

21. A system according to any of claims 14 to 20, wherein if an object model is not matched to a detected object in the received image then a test is performed to determine if the object is overlapped with another object, and the object is considered as occluded if an overlap is detected.

22. A system according to any of claims 14 to 21, further comprising means for counting the number of consecutive video images for which each object is tracked, and means for outputting a tracking signal indicating that tracking has occurred if an object is tracked for a predetermined number of consecutive frames.

23. A system according to any of claims 14 to 22, wherein if an object model is not matched to a detected object in the received image then a count of the number of consecutive frames for which the object model is not matched is incremented, the system further comprising means for deleting the object model if the count exceeds a predetermined number.

24. A system according to any of claims 14 to 23, wherein if a detected object is not matched to an object model then a new object model is stored corresponding to the detected object.